REMARKS

With regard to anticipation by Izumisawa:

In re claim 1: The rotor of the instant invention is of an entirely different nature and air-flow design than that of Izumsawa.

First, the rotor of a primary embodiment of the instant invention is an inward-flow radial turbine, as shown in FIG. 2,4, for example, (this is sometimes called a "centripetal" turbine – see "Principles of Turbomachinery", Macmillan, New York, 1963, p. 287, for example, copy attached for Examiner's convenience) having a radial inflow of air and an axial discharge.

Izumisawa, however, discloses a circumferential-flow rotor with radially moveable vanes, similar to a Wankel engine design, see FIG.17 of Izumisawa, in which the air A moves circumferentially from the inlet 245, to the early stage exhaust port 251, to the late stage exhaust port 253, and hence the rotor blade returns to the inlet.

The instant invention has an inward-flow radial turbine rotor; Izumisawa does not.

Second, the rotor of the instant invention is coaxial to the surrounding chamber, in Izumisawa the rotor is, of necessity, eccentric to the surrounding chamber.

Applicant respectfully wishes to point out that these are not minor differences of "design choice", but are fundamental differences that affect almost the entirety of the device.

Third, the rotor of the instant invention has fixed rotor blades, Izumisawa discloses rotor blades which are, of necessity, moveable radially with respect to the rotor body, see FIG. 17 of Izumisawa for example.

Claim 1 is herein amended to further clarify these differences.

Applicant respectfully submits that these are important elements and limitations present in the instant application that are not present in Izumisawa, and that Izumisawa therefore does not meet the threshold requirements for an anticipation rejection of claim 1.

In re claim 2,4, 15: Claim 2 includes the coaxial rotor, and the fixed rotor blades ~~of the~~, and the above discussion of these limitations applies equally to claim 2.

In addition, amended claim 2 includes a stator, between the rotor and an inner wall of the *chamber*, to direct inlet air to the rotor blades.

In Izumisawa, the support sleeve 171 that Examiner refers to as being a stator is *not* between the rotor and the inner wall of the chamber. Also, the support sleeve does not direct the inlet air to the rotor blades, being separated from the rotor blades by the passaging sleeve 173.

Lastly, in reading a claim the broadest definition that is *consistent with the specification* may be used for a term. In this case, the support sleeve of Izumisawa is merely a structural

support member, which is not consistent with the instant specification where the stator is clearly referred to in the air-flow element meaning.

Claims 2,4 are herein amended to further clarify these differences.

Applicant respectfully submits that these are important elements and limitations present in the instant application that are not present in Izumisawa, and that Izumisawa therefore does not meet the threshold requirements for an anticipation rejection of claims 2,4.

Reconsideration of the anticipation rejection is respectfully requested.

In re claim 3,5 rejected for obviousness v. Izumisawa in view of Kochte:

Applicant submits that Izumisawa and Kochte do not combine to produce the instant invention for the following reasons:

First, Izumisawa has a circumferential-flow rotor, and Kochte has an axial-flow stator (as shown in FIG. 3,4, for example). Applicant does not see how an axial-flow stator can work with a circumferential-flow rotor. Further, Applicant finds no suggestion in either reference to modify the respective devices to accommodate the air-flow direction of the other.

Second, regardless of there being no suggestion, Applicant questions whether any stator having a plurality of circumferential air-flow stator blades is even compatible with the radially moving rotor blades of Izumisawa. Applicant finds no suggestion in either reference on how to prevent the rotor blades of Izumisawa from extending into, and binding, in the gap that would be present between circumferential-flow stator blades (if such were adapted from Kochte). Such binding would appear likely to destroy the device, and the combination of elements would therefore be non-functional.

In addition, claim 5 adds a radial flow limitation which is not present in either reference and cannot, therefore, be present in any combination of the two.

Applicant respectfully submits that the combination of Izumisawa and Kochte does not meet the threshold requirements for an obviousness rejection of claims 3,5.

Reconsideration of the obviousness rejection is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (408) 358-0489.

Respectfully submitted,

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Test results quoted by Balje show efficiencies up to 0.85 for pressure ratios to about 3, and 0.75 for a pressure ratio of about 4, with R_e from 3—5.5 $\times$ 10^6 and $M_a{}^*$ from 0.57—1.04. Results quoted by von der Nuell (Ref. 1) for radial vaned turbines show efficiencies up to 0.86 at a head coefficient of 2. Von der Nuell also gives results of a backward curved vane compressor run as a turbine which gave a peak efficiency of over 0.8. The inward flow turbine of the Solar T-45 unit of 45 hp output (Ref. 3) has an efficiency of 0.78 (Ref. 4). One may therefore conclude that small inward-flow radial turbines can be designed to give very respectable efficiencies, ranging from 0.75 to 0.85, depending on values of Mach and Reynolds number. Many design details are only sketchily known, and there seems promise for further improvement and more particularly for more exact data to allow a more precise estimate of performance.

Other types of inward-flow turbine are possible, differing in detail from the design shown in Fig. 7.1(*a*). Fig. 7.3 shows a cantilever blade type in which vanes are provided only in the truly radial part of the rotor. Again experience is lacking, but it appears that vanes extending out to the axial discharge section are desirable. The Birmann type of turbine, Fig. 7.4, might be called a mixed-flow design since the vanes have a low ratio of inlet to outlet diameter. Tests of this type of turbine are reported in Ref. 5, showing rather a low efficiency compared to the values given above, but the tests were limited to a maximum speed of about 70% of design, and the performance was better than that of any axial-flow exhaust turbine of that time. Birmann has related his developments in centripetal turbines in Ref. 6, which contains many outline drawings and photographs of units designed for different applications. Two interesting applications to steam are shown, the first having the centripetal unit as the second of two turbine stages driving a three-stage centrifugal compressor raising 20,000 lb/hr of steam from 375 psig to 625 psig. The first stage axial impulse turbine expanded 10,000 lb/hr of steam from 375 psig to 5 psig, the centripetal unit completing the expansion down to about 2 in. Hg. absolute, at which low pressure an axial stage would have been impossible at the speed of 25,000 rpm necessary for the compressor. The other application to steam was one in which compactness and low weight were prime requirements, and again the centripetal turbine was well suited because of its ability to handle large volume flows at high rpm.

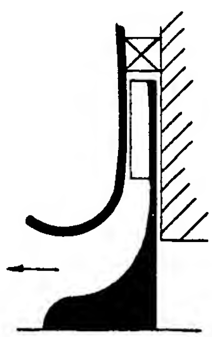

***Fig. 7.3** Straight radial blades*